

COMPONENT ACCEPTANCE MASTER TEST PLAN

Baseline
(Deliverable 1002 Task 10C)

October 6, 1995

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EXECUTIVE SUMMARY

The Component Acceptance Master Test Plan is a Level Two document that defines the government independent acceptance testing plans for the Earth Observing System Data Information System (EOSDIS) Core System (ECS) under the auspices of the Earth Science Data and Information System (ESDIS) Project Systems Management Office (SMO). The program described in this document is performed under the direction of the ESDIS Independent Verification and Validation (IV&V) Manager.

This plan covers common Component Acceptance Test (AT) planning, scheduling, execution, and post-test analysis for the Earth Observing System (EOS) Data Information System (EOSDIS) Core System (ECS). This plan also defines the responsibilities of all organizations involved with the Component AT. This plan is intended to define the framework for the Component AT from which lower level test plans and procedures are developed for each ECS release.

Primarily, the overall objective of the Component AT program is to verify all level 3 requirements (and level 4 requirements where needed for clarification) assigned to a specific ECS release. In addition, the Component AT planning will also address testing of high risk areas and/or weaknesses identified through discrepancy and test reports generated during ECS contractor testing.

To achieve these objectives the Component AT program will initiate the following activities:

- Test Planning and Definition
- Test Sequence Definition
- Test Execution
- Results Analysis
- Test Reporting.

This plan describes how those activities are to be conducted in support of the overall Component AT program objective.

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1. INTRODUCTION

1.1 Purpose

The purpose of this document is to define the objectives and technical approach for the ECS Component AT Program as managed by the ESDIS Project IV&V Manager. Component AT precedes the ESDIS SI&T Program, on a version by version basis, as defined in the EOS Ground System (EGS) Integration, Test & Validation Plan (EITVP).

1.2 Scope

This document provides planning for the Component AT activities that are directed by the ESDIS IV&V manager. Roles and responsibilities for the planning, coordination, and execution of component testing are established. Format and content for lower level plans and procedures are also defined in this document.

1.3 Content

The Component AT Plan is divided into four sections and appendices:

- Section 1 provides introductory material.
- Section 2 discusses the planning, execution, and reporting activities required to support the Component AT program.
- Section 3 defines the technical approach to Component AT.
- Section 4 discusses the conditions and constraints that affect the acceptance test team.
- Appendix A provides an acronym and abbreviation list.
- Appendix B provides the format and content description for detailed Component AT plans.
- Appendix C provides the format and content description for detailed Component AT procedures.
- Appendix D provides release-specific details regarding Component AT activities for ECS Release IR-1.
- Appendix E provides release-specific details regarding Component AT activities for ECS Release A.
- Additional appendices will be added to address future ECS releases AT activities.

1.4 Applicable Documents

The following documents are the parents from which this document derives its scope and content:

EOSVV-1005	EOS Ground System (EGS) Integration, Test & Validation Plan (EITVP) Baseline, 6/30/95.
Baseline	EOS Ground System Integration and Test Philosophy, 3/95.
Baseline	EOS Ground System Integration & Test Schedules, 8/95.

The following documents and materials were used in preparing the appendices.

194-219-SEI-XXX	ECS Interface Requirements Documents.
194-401-VE1-002	Verification Plan for the ECS Project, 6/94.
222-TP-003-006	Release Plan Content Description for the ECS Project, 5/95.
CDR Baseline	RTM database, CDR baseline, 8/95.
423-41-02	Functional and Performance Requirements Specification for the ECS-CH03, 11/94.
604-CD-003-001	ECS Operations Concepts Part 2A - ECS Release A, 7/95.
604-CD-001-004	ECS Operations Concept for the ECS Project: Part 1 - ECS Overview, 6/95.

2. COMPONENT AT APPROACH

The Component AT is the first phase of testing performed following an ECS release delivery to the government. Component AT is performed to independently verify level 3 requirements. In order to test the ECS, detailed test planning, scheduling, execution, analysis, and reporting must be performed. This section of the Component AT Master Plan defines those activities performed by the IV&V team. The overall Component AT responsibilities of the IV&V team, the Hughes development contractor, the developer Independent Acceptance Test Organization (IATO), and the Maintenance & Operations (M&O) team are shown in Exhibit 2-2.

2.1 Component AT Planning and Definition

The main objective of Component AT planning is to identify specific testing activities required to evaluate an ECS release and its associated requirements. Once identified, the process of mapping tests to specific requirements can proceed. Major planning objectives are to:

- Formulate overall objectives from requirements, high level release capabilities, and design documents.
- Produce a Component Acceptance Test Plan and Test Procedure documents for each release by identifying and defining specific tests.
- Schedule test execution.
- Identify and coordinate supporting services (such as DAACs, Institutional, etc.).
- Identify any tools and/or simulators needed during testing, including those internally created.

Exhibit 2-1 shows the flow starting from test objectives and finalizing with test cases which occurs during the test planning process.

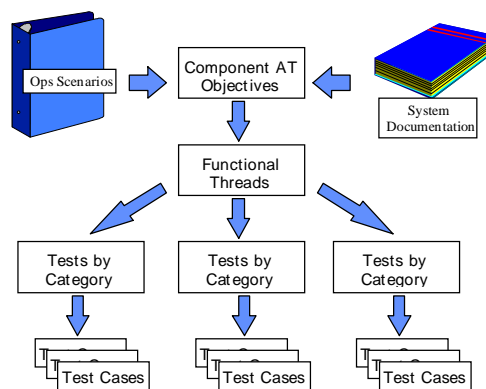


EXHIBIT 2-1: Test Definition Flow

Organization ----- Test Phase	IV&V	ECS developers, testers, engineers.	ECS IATO	EOC OPS & DAAC/ECS M&O
Planning	<p>Generate component test plans and procedures.</p> <p>Review information provided by ECS, interact with other IV&V tasks relating to ECS.</p> <p>Identify and investigate utility of tools included in ECS deliveries to testing.</p> <p>Examine availability and utility of internal tools and simulators for component testing.</p> <p>Prepare and disseminate test approach materials, scenarios and supporting requirements to external users and solicit feedback.</p> <p>Review additional test scenarios submitted by other parties for inclusion in test activities.</p>	<p>Provide ECS background information based on system deliverables, developer identified requirements traceability, and release capabilities mapping to components.</p>	<p>Review component test plans and procedures.</p>	<p>Review component test plans and procedures.</p> <p>Submit additional test scenarios including DAAC-unique scenarios.</p>
Test Schedule Definition	<p>Schedule individual tests within master schedule pre-determined windows.</p> <p>Prioritize tests and estimate resources (personnel, etc.) required to perform the test.</p>	<p>None.</p>	<p>Evaluate AT resource estimates.</p> <p>Help resolve support personnel and ECS resource contentions during test schedule generation.</p>	<p>Evaluate and coordinate personnel test support requirements.</p> <p>Identify personnel</p>

EXHIBIT 2-2: Overall Component AT Responsibilities by Organization

Organization ----- Test Phase	IV&V	ECS developers, testers, engineers.	ECS IATO	EOC OPS & DAAC/ECS M&O
Execution	<p>Direct/conduct all test plans and procedures defined tasks.</p> <p>Provide real-time decision making for test script deviations / adjustments.</p> <p>Perform roles of test director and test conductor.</p> <p>Ensure test data, environment, and personnel are available and ready for scheduled tests.</p> <p>Conduct daily debriefs.</p>	<p>Provide support, coordinated through ECS M&O, to include resolving major problems which stop test execution.</p>	<p>Provide one (1) month of on-site support for start-up of testing activities at ECS centers.</p>	<p>Provide personnel to perform and/or assist in actual test execution.</p> <p>Attend daily debriefs.</p> <p>Assist in resolving major problems affecting test execution.</p>
Analysis	<p>Perform real-time and post test analysis of expected results based on pre-defined procedures and expected results criteria.</p> <p>Identify problems and document via discrepancy reports.</p> <p>Interact with developers on problems encountered.</p>	<p>None.</p>	<p>Provide personnel, to support in the analysis and resolution of ECS nonconformances identified during testing.</p>	<p>Participate in analysis test results as required.</p>
Reporting	<p>Generate:</p> <ul style="list-style-type: none"> • Daily test activity debriefs, • 7 day flash test summaries, • Formal test reports. <p>These reports identify discrepancies and severity levels while including a recommendation for government acceptance.</p>	<p>Provide input to reporting activities, as applicable.</p>	<p>Provide input to reporting activities.</p>	<p>Review and provide inputs to reporting activities at the site.</p>

EXHIBIT 2-2: Overall Component AT Responsibilities by Organization (cont.)

2.1.1 Formulate Test Objectives

Component AT objectives are defined in order to determine the scope of a certain release to thus plan relevant tests for execution. The process of formulating test objectives starts by analyzing the planned release capabilities. These capabilities are then mapped to operational scenarios and goals to understand how the system meets user requirements and expectations. Level 3 requirements as used as needed for guidance for determining a working set of objectives.

2.1.2 Functional Thread Identification

The Component AT objectives are then reviewed to determine the functional thread tests. This next level of detail requires a thorough understanding of the release capabilities. Specific guidelines for identifying required tests are:

- Review the release plans to understand the scope of the version being tested.
- Review the requirements by release.
- Review existing Component AT system functional threads (for post IR-1 releases) to determine if they are applicable to the ECS release under test.

Evolving system functionality will require that existing test definitions be updated to incorporate new capabilities. The goal of this effort is to produce a comprehensive list of functional threads that can be used for developing specific tests. These threads are then mapped against Level 3 requirements to ensure full coverage of such specifications.

2.1.3 Test Definition

Development of tests at the component level is driven by five main documents or document sets:

- (1) ECS Functional and Performance Requirements
- (2) ECS Operations Concept
- (3) ECS Release Content Plan
- (4) ECS Users Guides
- (5) ECS Interface Control Documents.

The functional capabilities allocated to the release being tested are specified in the Release Plan Content Description for the ECS Project. These capabilities are mapped to Level 3 requirements in the Requirements Traceability and Management (RTM) data base. The IV&V analyst groups similar or supporting functional threads into test categories. The test categories available for Component AT of each release are:

- Internal Interface Tests (INT) - tests of data transport functions between ECS segments.

- External Interface Tests (EXT) - tests of data transport functions between ECS segments and external elements.
- Stand-alone Functional Tests (SFT) - tests of key functionality contained in a single ECS segment.
- Component Functional Thread Tests (CFT) - tests of functionality distributed between 2 or more ECS segments.
- Performance and Stress Tests (PST) - verification of performance requirements and evaluations of system performance under stress (maximum load and overload) conditions to analyze system degradation.
- DAAC Specific Tests (DST) - tests that will be identified to verify unique site capabilities or configurations. One example is an ECS extensions developed at a DAAC. These tests will be identified in coordination with DAAC personnel.

After functional threads are formalized into tests, test cases are developed to verify specific requirements or groups of requirements allocated to a test. A scenario is developed for each test case reflecting the operational concept for the function or group of functions exercised. Test procedure development follows, implementing the scenario in terms of major activities and expected results being defined. Detailed test steps are provided by reference to the appropriate user's guide, or other operational documentation. This process can be followed in more detail by referring to the format and content for release-specific Component Acceptance Test Plans and Test Procedures (Appendices B and C).

2.1.4 Component Acceptance Test Plan and Test Procedures

Once all the release planning activities are completed, the results will be documented in the Component AT Plans and Procedures. The Component AT Plans contains the detailed schedules and test descriptions for the ECS release to be tested. The Component AT Procedures contains the detailed, specific steps to execute the defined tests. These documents are expanded as additional information is developed, and once complete will fully describe the component test activities for a specific ECS release. The Component AT Plan and Test Procedures contain planning information as follows:

- Test case prioritization derived from function criticality in relation to release objectives and overall mission goals (defined in more detail in section 3.2).
- Affected sites and platforms along with defined software and hardware configurations.
- References to component release documentation.
- Identification of all personnel required to support Component AT activities and level of effort (defined in more detail in section 2.3).

The structure of the detailed Component AT Plan and Test Procedures is provided in Appendix B and C respectively.

2.2 Test Execution Sequence Definition

The first objective of the test sequence definition is to determine the execution order of the tests developed in the Component AT Plans. Exhibit 2-3 shows a sample relational execution order based on test category. Exceptions to the order presented will exist due to resource contention. Detailed test sequences will be developed during generation of the Component AT Plan. Appendices D and E present an initial process flow for identified tests.

The next task is to schedule Component AT activities within the ESDIS Master Schedule Level 3 test windows. The Component AT team prepares a Level 4 schedule for the testing planned for the specific ECS release. Component AT scheduling activities are the responsibility of the schedule manager. Specific scheduling activities include:

- Creating an internal Component AT schedule, based on the ESDIS Project master EGS test schedules, and providing the execution sequence for planned activities. Scheduling should be performed based on the criticality of the test and the availability of system resources.
- Meetings with M&O to determine resource and facility constraints and personnel availability. These meetings become critical in later releases when tests are executed alongside daily operations.
- Meetings with ECS IATO to coordinate the component hand-off as the system installation is completed.
- Maintaining the Component AT schedule based on updated external schedules and ensure changes to test activities are identified and implemented.

Once a tentative schedule has been determined, it will be entered into the schedule management tool for initial baselining and further updates. Development and maintenance of this schedule will be managed by either an available commercial off-the-shelf (COTS) product (e.g. MS/Project) or by an extension to the Test Management Data Base (TMDB), developed as part of the IV&V Integrated Support Environment, but either solution needs to be compatible with the ESDIS counterpart tool. Schedule management activities will ensure that identified resources are reserved for the execution of specific tests. All personnel required will be notified of the test activities as they are scheduled, preferably via email messages, by the Component AT director, as soon as possible, prior to TRR. More information about the TMDB can be found in section 3.4.3.3 of the EITVP.

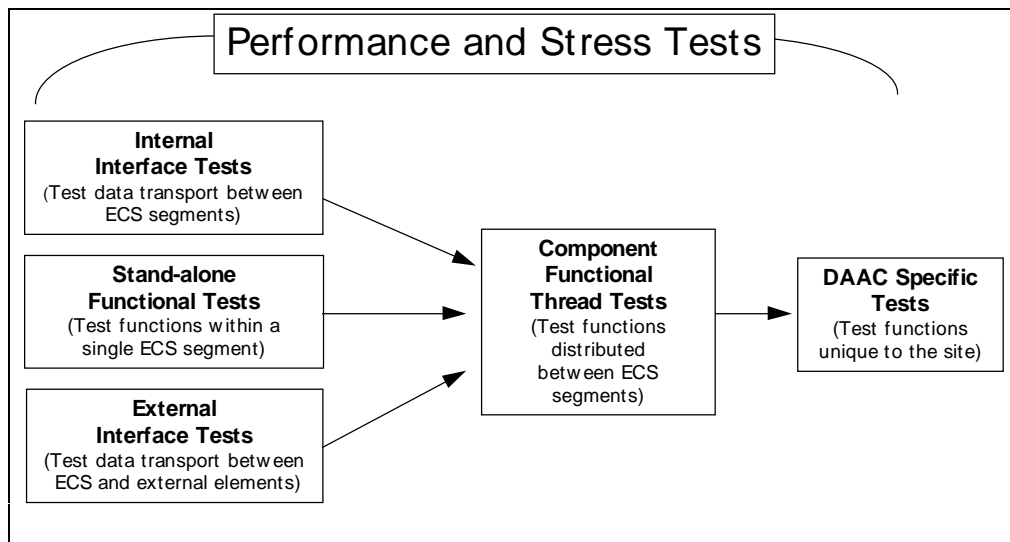


EXHIBIT 2-3: Component AT Functional Thread Flow

2.3 Component AT Execution

Test execution activities ensure that the Component ATs are executed as defined in test scenarios with explicit test cases and procedures, including expected results. The Component AT organization chart, Exhibit 2-4, defines the members of the Component AT team. This team along with DAAC/ECS M&O personnel will form an Integrated Product Team (IPT) responsible for Component AT activities. ECS M&O are expected to support ECS-specific tests which were previously scheduled and coordinated. The team also expects the ECS M&O personnel to assist in responding to major problems which prohibit test execution. Assistance from the ECS development team in solving major technical issues might be required and will be coordinated through ECS M&O.

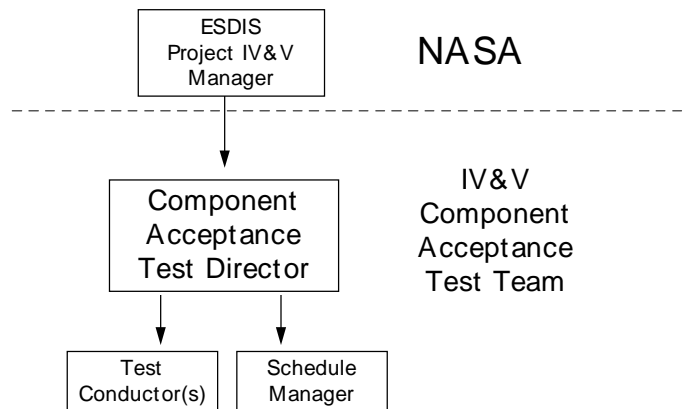


EXHIBIT 2-4:

Component AT

Organization Chart

2.3.1 Test Personnel

The Component AT director (TD) and test conductor (TC) are from the IV&V team. The TD has the overall responsibility for reporting to the ESDIS IV&V Manager the status of the assigned Component AT. The specific responsibilities of the TD are:

- Overall responsibility for all aspects of test conduct.
- Develop test concepts and execution sequence with DAAC/ECS M&O. This includes coordinating test activities with ongoing operational activities and incorporating any DAAC unique testing required at the site.
- Generate test reports.
- Manage issues and discrepancies related to assigned areas of responsibility.
- Attend relevant meetings. Chair the Test Readiness Review (TRR) and the debriefing meetings. The TRR attendance will include representatives from the participating DAACs and ECS contractor personnel.
- Liaison with personnel at testing sites.
- Monitor identified risk-sensitive areas.
- Authorize deviations from the approved test procedures and configurations to accommodate unanticipated problems or conditions (with concurrence from the NASA test monitor, as necessary).
- Authorize the Component AT to stop in the event that meaningful results cannot be obtained until system problems are resolved. DRs requiring resolution before testing proceeds must go through the ESDIS Project. DR submission is described in section 2.3.2.

TCs report to the TD and are responsible for assigned tests. TC responsibilities are similar to the TD but are limited in scope to a particular site or test.

Other planning responsibilities are distributed to various Component AT team personnel. These responsibilities include:

- Identify the data type/set requirements needed to perform the test. In addition, test tools and personnel needed to conduct the test will be identified and scheduled. Estimates on level of effort needed from the various participants will also be included for planning purposes.

- Identify the metrics and results to be collected during the test. The TMDB contains information regarding these areas. The metrics support the evaluation criteria associated with the test cases being executed.
- Ensure that required components, test tools, and personnel are available for the test as scheduled. This includes defining and establishing any communication requirements (teleconferencing, key telephone numbers, E-mail) needed to contact and coordinate remote locations that are involved in the test as well as additional resources such as test tools.
- Attend and support TRRs as required.
- Provide test procedures to M&O personnel and conduct dry runs to verify proper sequencing and execution of test procedures.

The Component AT team reviews all feedback and ultimately resolves any issues or resource conflicts identified during the test plan reviews and dry runs of test procedures.

2.3.2 Test Tools

The types of test tools that may be applied to government Component AT include test data generation and analysis tools, and test scripting tools. Test data for government Component AT is intended to be generated by the EOSDIS Test System (ETS) starting with ECS Release A. ETS also provides the results analysis capability required by the IV&V contractor. ECS contractor test data generation and analysis tools may be applied to government Component AT provided that the tools themselves have been validated and available for use. Re-use of specific ECS contractor test data sets will be avoided, in that for many functions, the same test data amounts to the same test. The test scripting tools XRunner and LoadRunner are employed by the ECS contractor. The IV&V contractor has also been trained in the use of these tools and is currently using them to support IV&V Version 0 Evaluation. XRunner and LoadRunner may be used to support government component acceptance testing where close control of test steps is needed for reproducibility, or the generation of multiple user processes is required.

2.4 Analysis

Real-time analysis is performed based on screen displays, expected results, and successful test step completion. Post-test analysis, performed by IV&V Component AT team members, includes data reduction, comparison with expected results, and inspection of history and error logs. The XRunner, LoadRunner, and ETS tools all have built in comparison utilities. DAAC/ECS M&O personnel are called upon to assist in analysis of DAAC related test results. As problems are found during the analysis phase, Discrepancy Reports (DRs) are generated and submitted to the EGS Test Oversight Committee. Based on the developer's findings, tests may need to be rerun, or patches may need to be installed. Results from the analysis phase of Component AT are included in the reports generated upon test completion.

2.5 Reporting

When Component AT is in progress, the test conductor issues a brief daily testing activity report. This is an informal report distributed by email containing information resulting from the daily test team debrief. The TC will consolidate comments from all participants, including DAAC personnel, and will provide the report to the test director and specified distribution. Guidelines on the format and content of the daily test activity report can be found in the EITVP. Any deviations from the specified format will be documented in specific Component Acceptance Test Plans.

Flash test summaries are published within seven days of Component AT completion. These reports will be prepared in contractor technical analysis memo (TAM) format, and will detail the number of tests successfully completed, number of failed tests, and the number of pending tests. A summary of severe DRs already identified to date are included in these summaries.

Formal test reports are published for Component AT within 45 days of the completion. A draft version is produced within 4 weeks, followed by the final version. The format and content of the formal test report are presented in the EITVP.

2.6 Configuration Management

The following discussion is limited to the scope of this document only which is the Component AT activities under the direction of the ESDIS IV&V manager. Since ECS is a distributed system, it is understood that references to external entities are confined to those which use or host ECS components. However, the focus of this section is on configuration management activities immediately before and during Component AT. The specific responsibilities of the test team are to:

- Support tracking of baseline content to be delivered.
- Verify configuration control by ensuring that the correct baseline is installed immediately prior to commencement of Component AT activities.
- Continue monitoring baselines at selected sites as required.
- Generate DRs during Component AT execution and post-test analysis.
- Track all DRs and CCRs generated during Component AT.
- Control the test configuration during execution.

2.6.1 System CM Overview

The test team supports tracking of the ECS baseline content to be delivered. Upon delivery of the ECS to the ESDIS Project, configuration control is established. This includes both software and hardware as delivered to the site. A COTS tool will be chosen to control the configuration of

ECS on a system-wide level. Tool choices made by ECS and other component developers will be considered. Once configuration control has been established, only modifications which have formal Project approval are applied to the as-delivered product baseline. Support of baseline content tracking directly aids the verification of configuration control immediately prior to test execution. Configuration verification is performed in coordination with ECS M&O personnel. Configuration changes are monitored by IV&V at appropriate host sites whose unique requirements have been previously identified and which require special configuration provisions.

The EGS Pre-Board is the review and dispositioning body for all DRs generated. Every DR is submitted to the EGS Pre-Board. The Pre-Board discusses open DRs which impact entities within ECS. Some DRs may spawn CCRs which are passed on to the ESDIS Configuration Control Board (CCB). DR analysis may identify other problems which are not strictly ECS problems. For each case, the EGS Pre-Board tracks disposition of DRs/CCRs when they are passed to the ESDIS CCB and/or external configuration control bodies. Further documentation and analysis, if needed, is developed and reviewed by IV&V in coordination with other members of the Pre-Board as needed. The membership of the Pre-Board includes representatives from the IV&V team, the ECS developer, testing and engineering teams, IATO, EOC and DAAC M&O, EDOS, EBnet, other institutional support facilities as needed, and mission teams.

2.6.2 Test CM

The first items to be brought under configuration management are the test procedures. These are submitted before or immediately after TRR. Thereafter, they become ESDIS-controlled documents and any changes, including redlines made during test execution, are submitted for formal review and approval. During test execution and post-test analysis, all problems and anomalies encountered are documented as DRs via the discrepancy reporting tool. This tool tracks a problem from generation, through test team investigation and analysis, to resolution. The TD reviews DRs for problem analysis and validity, then forwards all unresolved DRs to the EGS Pre-Board for evaluation and disposition. After evaluation by the EGS Pre-Board, open DRs are forwarded to the appropriate configuration control body/bodies with any supporting documentation which may be necessary. In the case of the ESDIS CCB, approved CCRs which mandate fixes, patches or changes for inclusion in subsequent releases require regression testing. Once regression testing has been scheduled and successfully executed, the DR is closed.

3. CONDITIONS AND CONSTRAINTS

The Component AT team's environment is controlled by defined conditions and constraints. In order for the team to successfully complete their testing within the assigned test window, they must monitor these conditions. This section identifies the conditions and constraints that ECS may encounter and how the team will work toward mitigating these issues.

3.1 Acceptance Testing Issues Monitoring

The IV&V team has identified risk areas that may affect Component AT. While the actual risks are monitored and managed by the ESDIS Project, the outcome of the risks may affect the Component AT. Therefore, four categories of risks have been identified for Component AT monitoring:

- Component Issues - problems with component delivery with known deficiencies. Some risk indicators for this category are delivery schedule slips and numerous DRs.
- Resource Contention - problems with resource availability. Possible risk indicators for this category include increasing instances of postponements and cancellations.
- Information Management Issues - lack of sufficient information to adequately plan or develop procedures.
- Schedule Issues - test tools, test team, and overall schedule issues. The risk indicators in this category include schedule slips, or test tool delivery schedule slips.

Once the risks indicators are noted, the team monitors their mitigation.

3.2 Component AT Issue Mitigation

Since the Component AT team only controls its own resources, any external issue mitigation strategies are necessarily passive. The EGS Test Oversight Committee serves as the forum for addressing these issues. Issue mitigation strategies include:

- Prioritization: Test procedures are scheduled to execute during a specified window of time. One of three priorities is assigned to each planned test and they are executed according to the assigned priority.
 1. Priority 1 - The minimum test effort required to verify critical functionality; high risk involved in foregoing these tests. This is the highest priority test.
 2. Priority 2 - Provides higher confidence level and insight into component readiness; moderate risk involved in foregoing these tests.

3. Priority 3 - Tests of low criticality functions or functions verified with a high degree of confidence in previous testing; low risk involved in foregoing these tests.

The following methods are used in assigning priority to the individual tests:

- Using the Criticality Analysis and Risk Assessment (CARA) Report developed by the IV&V contractor, prioritize Component AT on functionality deemed to have the greatest risk to the success of the component in the operational environment.
- Using results from witnessing the developer's acceptance testing, prioritize Component AT on the functionality that experienced the most difficulty.
- Using the Block Oriented Network Simulator (BONeS) model analysis performed by the IV&V contractor, focus Component AT performance tests on the areas of the system the model identifies as high risk.

Preliminary test prioritization will be documented in the specific Component AT Plans for planning purposes.

- Substitution: If a support capability such as the ETS is not available to the Component AT team, an alternative is sought (such as re-use of other test data or access to the spacecraft simulator). Test plans shall identify alternate resources in the event that the prime resource is unavailable. The integration team shall also prepare to practice schedule substitutions, that is, have more than one test ready to execute during a given period. If resources cannot support one test, another test not requiring the unavailable resource is executed instead. Finally, the Component AT team is ready to substitute different tasks for the one originally planned.
- Issue Tracking: Test issues are regularly monitored by the IV&V contractor. If the indicators increase, the IV&V contractor notifies the ESDIS IV&V Manager at the regular Component AT team meetings. The Component AT team will then make preparations to mitigate the issue using the appropriate strategy.

APPENDIX A: LIST OF ACRONYMS

AM-1	EOS AM Project spacecraft 1
AT	Acceptance Test
BONeS	Block Oriented Network Simulator
CARA	Criticality Analysis and Risk Assessment
CFT	Component Functional Thread Test
CM	Configuration Management
COTS	Commercial Off-The-Shelf
DAAC	Distributed Active Archive Center
DRs	Discrepancy Reports
EBnet	EOSDIS Backbone Network
ECS	EOSDIS Core System
EDOS	EOS Data and Operations System
EGS	EOS Ground System
EICP	ESDIS Integration and Certification Plan
EITVP	EGS Integration, Test and Validation Plan
EOC	EOS Operations Center (ECS)
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
ESDIS	Earth Sciences Data and Information System
ETS	EOSDIS Test System
EXT	External Interface Test
F&PRs	Functional Performance Requirements
GSFC	Goddard Space Flight Center
I&T	Integration and Test
IATO	Independent Acceptance Test Organization
ICD	Interface Control Document
INT	Internal Interface Test
IPT	Integrated Product Team
IR-1	Interim Release-1
IRD	Interface Requirement Document
ISVVP	Independent System Verification and Validation Plan
IV&V	Independent Verification and Validation
M&O	Maintenance and Operations
PIs	Principal Investigators
PST	Performance and Stress Test
RTM	Requirement and Traceability Management
SCF	Science Computing Facility
SFT	Stand-alone Functional Test
SI&T	System Integration and Testing
SMO	Systems Management Office
TAM	Technical Analysis Memo

Component Acceptance Master Test Plan

TBS	To Be Supplied
TC	Test Conductor
TD	Test Director
TMDB	Test Management Data Base
TRMM	Tropical Rainfall Measuring Mission (joint US-Japan)
TRR	Test Readiness Review

APPENDIX B: COMPONENT ACCEPTANCE TEST PLAN

The Component Acceptance Test Plan describes the overall structure for the testing of a specific ECS release. It identifies the capabilities being provided by that release, provides a brief system overview and schedule. For each test identified in the overview, a detailed test description is provided. The Component Acceptance Test Procedures are developed directly from the detailed test descriptions in the plan. The format and contents for the plan are provided below.

COMPONENT ACCEPTANCE TEST PLAN

1.0 Introduction

1.1 Purpose and Scope

The purpose is to describe the component acceptance testing for ECS release XX, and the scope is limited to that effort.

1.2 Content

1.3 Applicable Documents

This section will reference all documentation necessary for successful testing of this release of the ECS.

2.0 Release XX Overview

2.1 Required Capabilities

Release XX is required to support the following major capabilities:

such as, Geographic browse capabilities
 Limited production capabilities at the DAACs, etc.

2.2 The ECS Release XX

Provide a simplified block diagram consistent with the EGS wall chart depicting ECS Release XX. Also details sites, platforms, hardware included with this release.

3.0 Release XX Component AT Program Overview

The release XX Component AT program includes these tests. (by category - INT, EXT, SFT, CFT, PST)

3.1 Master Test Schedule Event Release XX mapping

Discuss in detail the mapping of test events to specific component thread tests.

3.2 Execution order dependencies

List any component functional thread test or test case order dependencies.

3.2 Schedule

Component AT schedule of planned tests based on constraints from Master Schedule.

3.3 Conditions and Constraints

Identify issues and mitigation activities affecting Component AT activities. Assign priority 1, 2 or 3 to all tests as described in section 3.2. Discuss the risk involved in not running each test. Identify opportunities for resource, schedule, and task substitution, should they become necessary.

3.4 Roles and Responsibilities

Identify personnel required to support Component AT activities to include IV&V team members and institutional support personnel.

4.0 Test Descriptions

For each test identified in Section 3, provide the following:

4.x A - Z Test

Test Objectives:

The overall objectives of the A - Z test are to:

Verify the ability to support ingest of TRMM ancillary data,
Exercise the configuration management tool, etc.

Requirements Verified:

List the requirements verified by requirement ID and full text.

Test Configuration:

Describe the test configuration including any special configuration needed.

Support Requirements:

a. Institutional Support

Identify any support needed from institutional elements for data and or voice communications.

b. Test Data Descriptions

Identify each test data set required in terms of the characteristics required (e.g. - "20 minutes of XXX format q instrument data with the following anomalies . . .").

c. Internal Communications

Identify voice and data circuits provided by internal ESDIS elements, e.g., EBnet.

Test Cases:

Test Case 1: High Rate AM-1 Spacecraft data

Provide a narrative scenario description for the test case. "ETS will transmit AM-1 format q data at 900 kbps, etc."

Acceptance Criteria:

Provide acceptance criteria mapped to the requirements being verified.

"All data is received without loss or corruption - ECS F&PR XXX"

Test Case n: A - Z Error Handling

APPENDIX C: COMPONENT ACCEPTANCE TEST PROCEDURES

This document provides acceptance test procedures for the ECS Release under test. These procedures are generated at the “major event” level of detail with steps such as: “Transmit AM-1 spacecraft data from ETS to ECS at the test conductor’s direction”, “Uplink Command load TEST_X1 in accordance with Command and Telemetry sub-system user’s guide”, “Ingest test data set SCIENCE_K in accordance with Goddard DAAC Standard Operating Procedures.” Procedures for test setup, execution, and termination are provided, along with guidelines for any post test analysis required.

Provide the following for each test described in Section 4 of the Component Acceptance Test Plan:

4.x A - Z Test

Summary:

Provide a one paragraph summary of what this test is about and what it’s trying to verify.

Test Configuration:

Reproduce the configuration information from the test description in the part 1 document and expand to the computer software component level.

Test Data:

Identify each data set by file name, or generation script name. This should map to the test data description in support requirements section of the test description in the part 1 document.

Procedures:

Numbered, procedural steps in sufficient detail to produce repeatable tests, referencing the appropriate user’s guides or operator documentation.

<u>Step</u>	<u>Station</u>	<u>Action / Expected Results</u>	<u>Time Complete</u>
1.	EOC Command Console	Do this: Look for this:	

(This format applies to Set-up, Execution, and Termination sections)

Test Set-up

Bring systems up or confirm systems up and configured properly, check voice & data links, open log files, etc.

Test Execution

Execute the test cases described in the corresponding scenarios of the part 1 document.

Test Termination

Close log files, collect data, put things back the way you found them, etc.

Post -test Analysis:

Instructions for any complex data reduction or examination needed to establish pass/fail events in terms of the acceptance criteria in the part 1 document.

APPENDIX D: ECS IR-1 COMPONENT ACCEPTANCE TEST OVERVIEW

Interim Release 1 (IR-1) provides basic ingest functionality and supports the interfaces required for TRMM Mission Support. Currently, we have identified 14 tests. These tests were selected to support the functionality identified in the IR-1 Release Capabilities Mapping. It should be clearly understood that the tests and test cases presented here are our preliminary understanding and are subject to change. The IR-1 test program will be fully developed in the IR-1 Component Acceptance Test Plan and Procedures. Requirements to test case traceability will also be provided in the IR-1 Component Acceptance Test Plan and Procedures.

Component Functional Thread Tests (CFT)

CFT01: Science Software Integration and Operations

Test Cases

CFT01.1 - Receipt of Science Software Delivery Package and/or Calibration Coefficients

CFT01.2 - SCF Algorithm Validation

CFT01.3 - Algorithm Configuration Management

CFT01.4- Algorithm Execution and Monitoring

CFT02: Science Product Generation and Availability

Test Cases

CFT02.1 - Execution of Science Product Generation Algorithms

CFT02.2 - Availability of ECS-generated TRMM Data Products

DAAC Specific Tests (DST)

These tests will be developed in coordination with DAAC personnel.

External Interface Tests (EXT)

EXT01: TRMM Level 0 Data Ingest

Test Cases

EXT01.1 - Transfer of TRMM L0 Data From GSFC SDPF

EXT01.2 - Ingest and Validation of Received TRMM Level 0 Data

EXT01.3 - Level 0 Data Availability for ECS Operations

EXT02: TRMM Data Product Ingest

Test Cases

EXT02.1 - Transfer of TRMM Data Products From TSDIS

EXT02.2 - Reception of TRMM Platform Orbit/Attitude Data From GSFC
SDPF

EXT02.3 - Ingest and Validation of Received TRMM Level 0 Data

EXT02.4 - TRMM Data Availability for ECS Operations

EXT03: NOAA and Non-EOS Ancillary Data Ingest

Test Cases

EXT03.1 - Polling and Transfer of NOAA/Non-EOS Ancillary Data

EXT03.2 - Ingest and Validation of Received NOAA/Non-EOS Ancillary Data

EXT03.3 - NOAA/Non-EOS Ancillary Data Availability for ECS Operations

EXT04: Data Product and Ancillary Data Distribution to TSDIS

Test Cases

EXT04.1 - Data Product Transmission to TSDIS (VIRS reprocessed)

EXT04.2 - Ancillary Data Transmission to TSDIS (NOAA, Non-EOS)

Internal Interface Tests (INT)

INT01: System Deployment Verification

Test Cases

INT01.1 - Site Hardware Configuration Verification

INT01.2 - Site Software Configuration Verification

INT02: System Test Support Verification

Test Cases

INT02.1 - System Monitoring Support

INT02.2 - Report and Log Availability

Stand-Alone Functional Tests (SFT)

SFT01: Network Operations and Monitoring

Test Cases

SFT01.1 - Network Configuration and Status Monitoring

SFT01.2 - Network Performance Monitoring

SFT01.3 - Network Fault Isolation and Recovery

SFT02: System Operations and Administration

Test Cases

SFT02.1 - System Hardware Status Monitoring

SFT02.2 - System Software Status Monitoring

SFT02.3 - System Performance Management

SFT02.4 - Policies and Procedures Management

SFT02.5 - Fault Isolation and Response

SFT02.6 - OA Tool Availability

SFT02.7 - System Backup Availability

SFT03: System Access and Connectivity

Test Cases

SFT03.1 - LAN Access

SFT03.2 - WAN Access

SFT03.3 - Protocol Verification

SFT03.4 - File Transfer

SFT03.5 - Electronic Messages

SFT04: System Security Administration

Test Cases

SFT04.1 - User Account Management

SFT04.2 - User Group Specification

SFT04.3 - User Privilege Authentication

SFT04.4 - Security Fault Detection and Response

SFT05: DAAC Operations and Administration

Test Cases

- SFT05.1 - DAAC Hardware Status Monitoring
- SFT05.2 - DAAC Software Status Monitoring
- SFT05.3 - System Performance Management
- SFT05.4 - Policies and Procedure Management
- SFT05.5 - Fault Isolation and Response
- SFT05.6 - OA Tool Availability

SFT06: ECS Standard Services

Test Cases

- SFT06.1 - SDP Toolkit Availability
- SFT06.2 - ECS Standard Services Availability

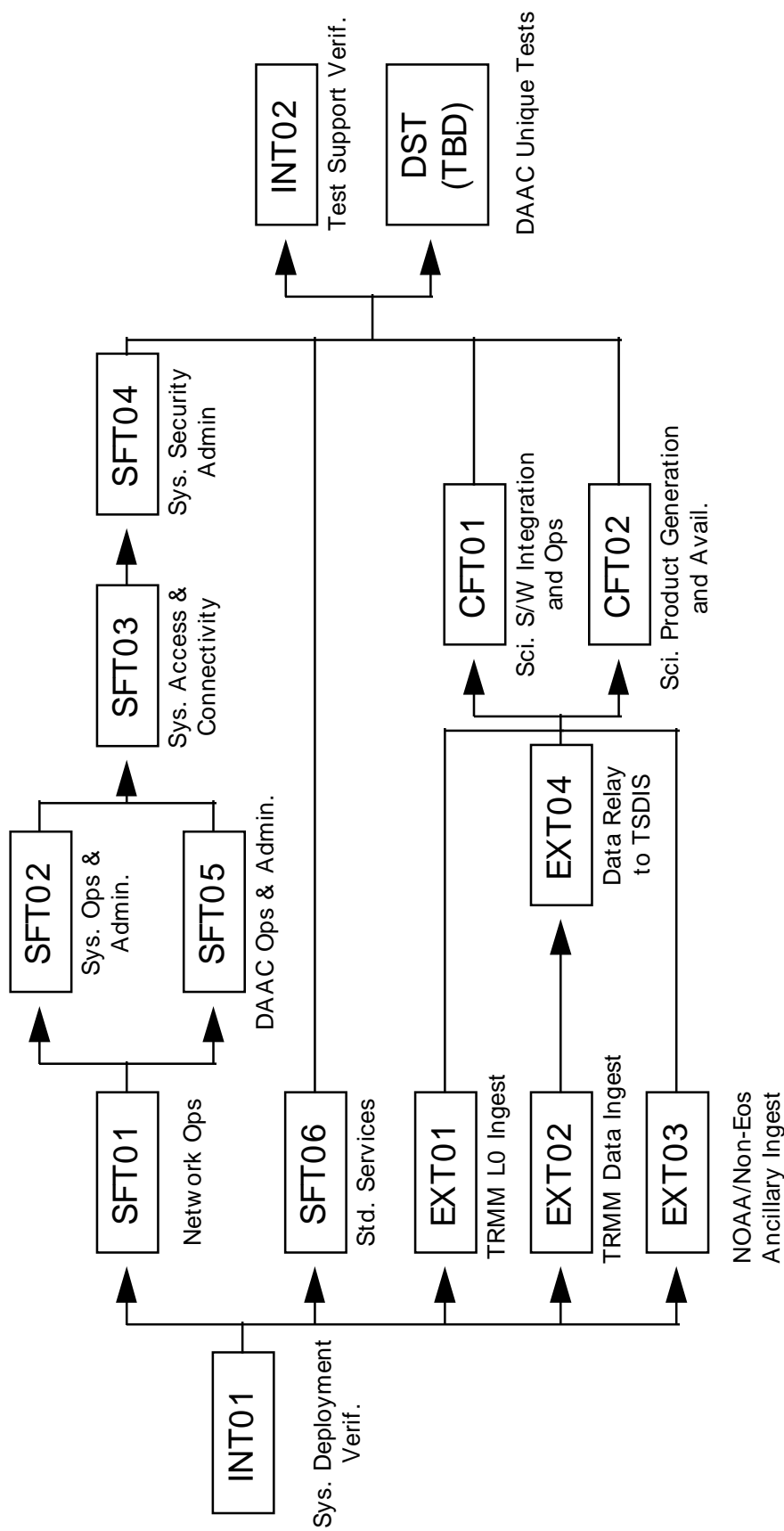


EXHIBIT D-1: IR-1 Dependencies

APPENDIX E: ECS RELEASE A COMPONENT ACCEPTANCE TEST OVERVIEW

ECS Release A supports Version 0 Interoperability, TRMM data processing operations, User search and access functions, and support for interface testing for those interfaces supporting Landsat 7 and the AM-1 missions. Currently, we have identified in 42 tests to exercise this release. These tests were selected to support the functionality identified in the Release A Release Capabilities Mapping. It should be clearly understood that the tests and test cases presented here are only our preliminary understanding and are subject to change. The Release A test program will be fully developed in the Release A Component Acceptance Test Plan and Procedures. Requirements to test case traceability will also be provided in the Release A Component Acceptance Test Plan and Procedures.

Component Functional Thread Tests (CFT)

Test cases for the following tests are still under development.

CFT01: Mission Planning and Scheduling

CFT02: Engineering Telemetry Processing, Display, Analysis, and Logging

CFT03: Mission Commanding

CFT04: TRMM production processing

CFT05: AM-1 production processing

CFT06: Algorithm I&T

CFT07: Science Data User Access

CFT08: Landsat Ingest

CFT09: V0 Interoperability

DAAC Specific Tests (DST)

These tests will be developed in coordination with DAAC personnel.

External Interface Tests (EXT)

Test cases are still under development for the following tests.

EXT01: ECS - NSI Interface Test

EXT02: ECS - SCF Interface Test

EXT03: ECS - ADC Interface Test

EXT04: ECS - EDOS Interface Test

EXT05: ECS (GSFC DAAC) - NESDIS Interface Test

EXT06: ECS (GSFC DAAC) - DAO Interface Test

EXT07: ECS (MSFC DAAC) - SDPF Interface Test

EXT08: ECS (LaRC DAAC) - SDPF Interface Test

EXT09: ECS - TSDIS Interface Test

EXT10: ECS - Landsat

EXT11: ECS - NCC Interface Test

EXT12 - ECS - FDF Interface Test

Internal Interface Tests (INT)

Test cases are under development for the following tests.

INT01: Inter-DAAC Communications

Performance and Stress Tests (PST)

Test cases are under development for the following tests.

PST01: Ingest Performance and Stress Test

PST02: AM-1 Production Processing Performance Test

PST03: Release A Daily Operations Test

Stand-Alone Functional Tests (SFT)

SFT01: Network Management Test (CSMS)

Test Cases

SFT01.1 - Alarms and Displays

SFT02: Performance Management Test (CSMS)

Test Cases

SFT02.1 - Event Logging

SFT02.2 - Statistics Reporting

SFT02.3 - Data and trend analysis

SFT03: System Management Test (CSMS)

Test Cases

SFT03.1 - Fault isolation and recovery

SFT03.2 - Security Management

SFT03.3 - System Management Reports

SFT04: Data Server Test Series (SDPS)

Test Cases

SFT04.1 - Service and data advertising

SFT04.2 - Data Insertions (TRMM, V0, TRMM ancillary)

SFT04.3 - Data Searching (summary data, stored data)

SFT04.4 - Subscription Services

SFT04.5 - Core metadata and geophysical parameter searching

SFT04.6 - Data schema generation (TRMM and initial V0)

SFT05: Data Storage and Cataloging (SDPS)

Test Cases

SFT05.1 - Physical media import / export

SFT05.2 - Inventory, browse and ordering

SFT05.3 - ECS Guide population

SFT05.4 - Metadata insertion and updates

SFT05.5 - Error and Exception handling

SFT06: Data Distribution (SDPS)

Test Cases

- SFT06.1 - Physical media distribution
- SFT06.2 - Electronic distribution
- SFT06.3 - Distribution status reporting
- SFT06.4 - Data re-formatting
- SFT06.5 - Error and Exception handling

SFT07: Data Ingest (SDPS)

Test Cases

- SFT07.1 - Metadata validation and ingest
- SFT07.2 - Physical media validation and ingest
- SFT07.3 - Standard Product (L0 - L4) validation and ingest
- SFT07.4 - Algorithm validation and ingest
- SFT07.5 - V0 product ingest
- SFT07.6 - Error and Exception handling
- SFT07.7 - Ancillary data ingest

SFT08: Science Data Production Planning and Management (SDPS)

Test Cases

- SFT08.1 - Production Planning
- SFT08.2 - Production Management

SFT09: Science Data Production (SDPS)

Test Cases

- SFT09.1 - Process Queue Management
- SFT09.2 - Production Performance
- SFT09.3 - Accounting and QA
- SFT09.4 - Error and Exception Handling

SFT10: Version 1 Client (SDPS)

Test Cases

- SFT10.1 - User identification, authentication, and access
- SFT10.2 - Browsing and Searching
- SFT10.3 - Data Request and Retrieval
- SFT10.4 - Image Displays
- SFT10.5 - Error and Exception handling

SFT11: Mission Planning and Scheduling (FOS)

Test Cases

SFT11.1 - Spacecraft scheduling

SFT11.2 - Instrument scheduling

SFT11.3 - Mission Timeline generation

SFT12: Commanding and Command Management (FOS)

Test Cases

SFT12.1 - Instrument load generation and validation

SFT12.2 - Spacecraft load generation and validation

SFT12.2 - Ground Script Generation

SFT12.3 - Real time Commanding

SFT12.4 - OBC load generation, validation and uplink

SFT13: Engineering Telemetry Processing (FOS)

Test Cases

SFT13.1 - Limit checking

SFT13.2 - Engineering Unit conversion

SFT14: Trend Analysis and Reporting (FOS)

Test Cases

SFT14.1 - Spacecraft trend analysis

SFT14.2 - Instrument trend analysis

SFT15: EOC Resource Management (FOS)

Test Cases

SFT15.1 - Processing string initialization & configuration

SFT15.2 - Failover

SFT16: EOC Data Management (FOS)

Test Cases

SFT16.1 - Event logging

SFT16.2 - Telemetry logging

SFT16.3 - PDB Management

SFT17: FOS User Interface (FOS)

Test Cases

SFT17.1 - Window management

SFT17.2 - STOL/CSTOL syntax check

SFT17.3 - Display and report demonstration

SFT17.4 - Ground script execution

Dependencies:

Flight Operations Segment test dependencies are shown in Exhibit E-1. CSMS / SDPS test dependencies are shown in Exhibit E-2. Performance and Stress Tests, are executed after all other testing.

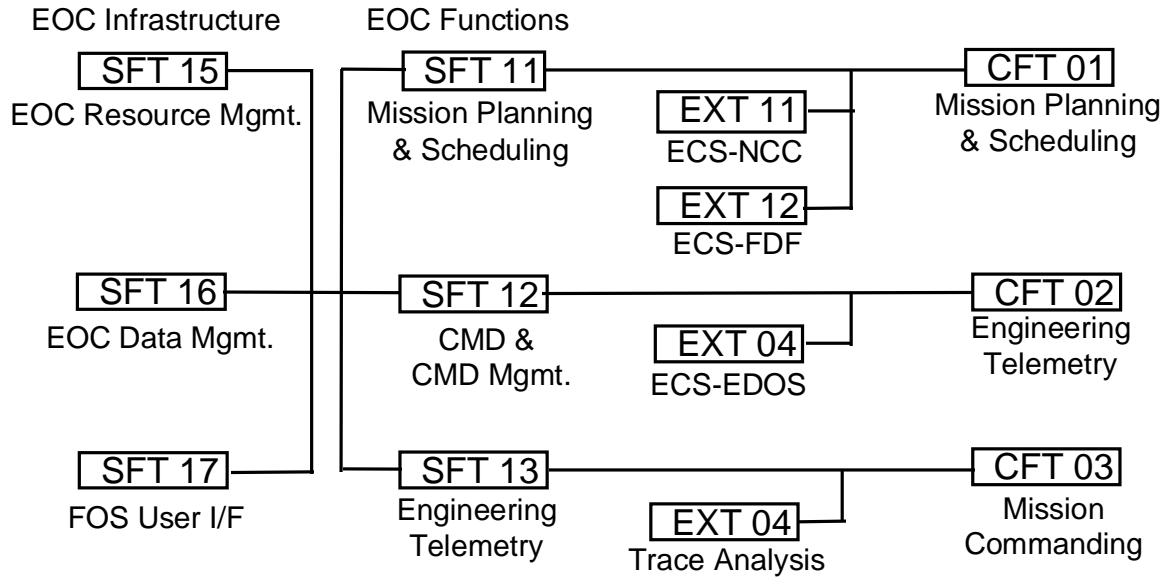


EXHIBIT E-1: FOS Test Dependencies

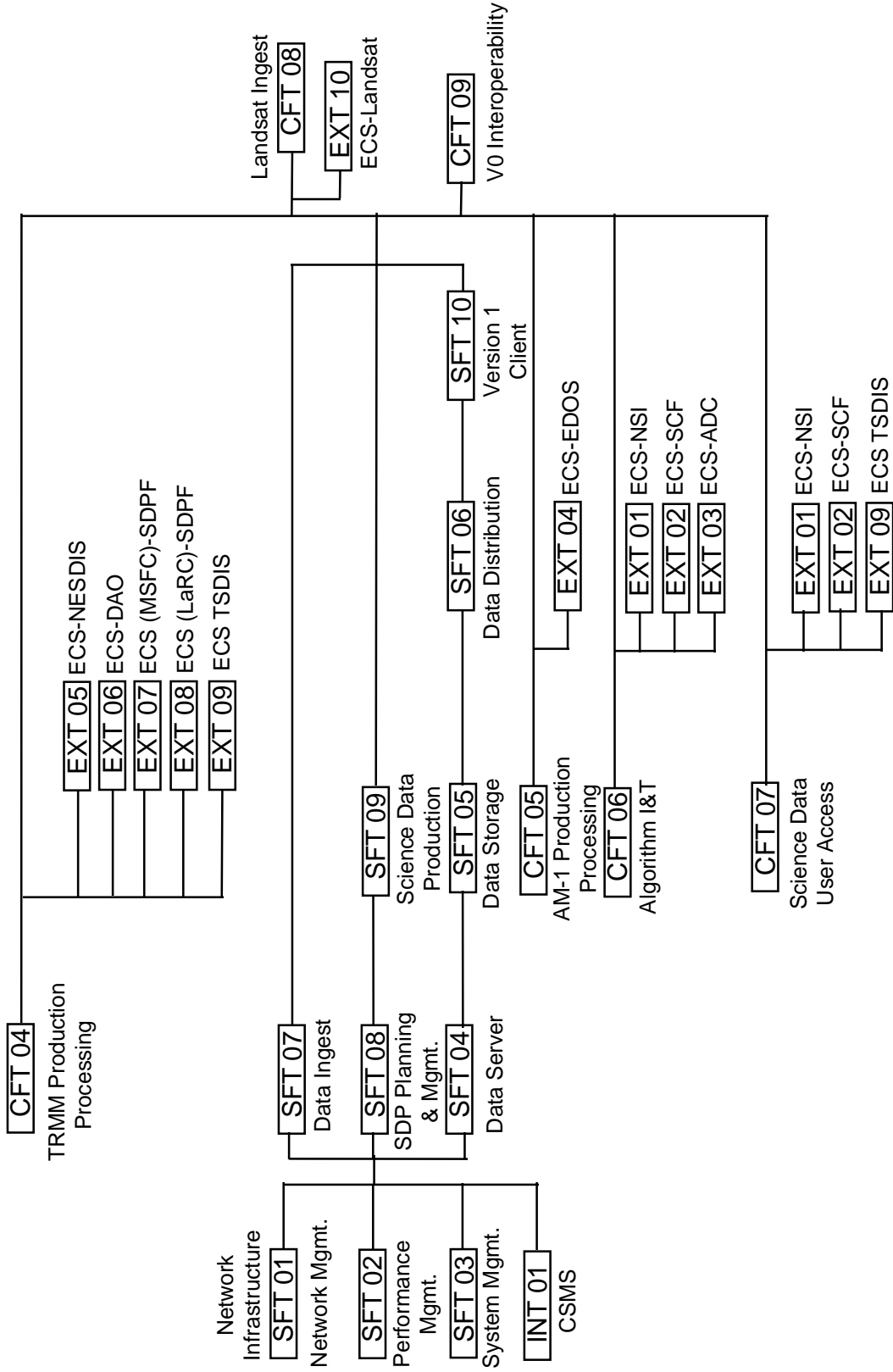


EXHIBIT E-2: CSMS/SDPS Dependencies

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Last Saved By: Authorized Gateway Customer
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As of Last Complete Printing
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 Number of Words: 7,583 (approx.)
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